



SCANNER VAN SURVEY

Chicago, Illinois
Streeterville Area

June 20 - 22, 2000



July 12, 2000

United States Environmental Protection Agency
Radiation and Indoor Environments National Laboratory
4220 S. Maryland Parkway
Las Vegas, Nevada 89193

The gamma radiation scanning survey of the Chicago Streeterville area was done June 20 through June 22, 2000. The streets scanned are delineated on the attached map. The overall procedure is outlined in the attached, "Quality Assurance Project Plan, Scanner Van Survey, Chicago Illinois, Streeterville Area."

Prior to the actual scan, background gamma levels were obtained by driving through Streeterville and obtaining reference readings from open areas not believed to be contaminated and from brick and stone buildings. Normally a background would be taken in an adjacent area, not believed to be contaminated but having essentially the same characteristics. For an urban area like Streeterville it was too difficult to find such an area so it was decided to use the lowest measured values in the scan as background levels and then look for deviations from these. Brick and stone buildings were part of the reference values since these contain natural radioactivity that is not considered contamination.

Once background reference levels were established, the streets shown on the accompanying map were driven. In addition, two parking lots were entered and scanned. These were (1) at west end of the block bounded by Illinois Street, McClurg Court and Grand Avenue and (2) at the east end of the block bounded by Grand Avenue, McClug Court and Ohio Street. In several cases, foot surveys were conducted to further explore anomalous readings and investigate known areas of contamination.

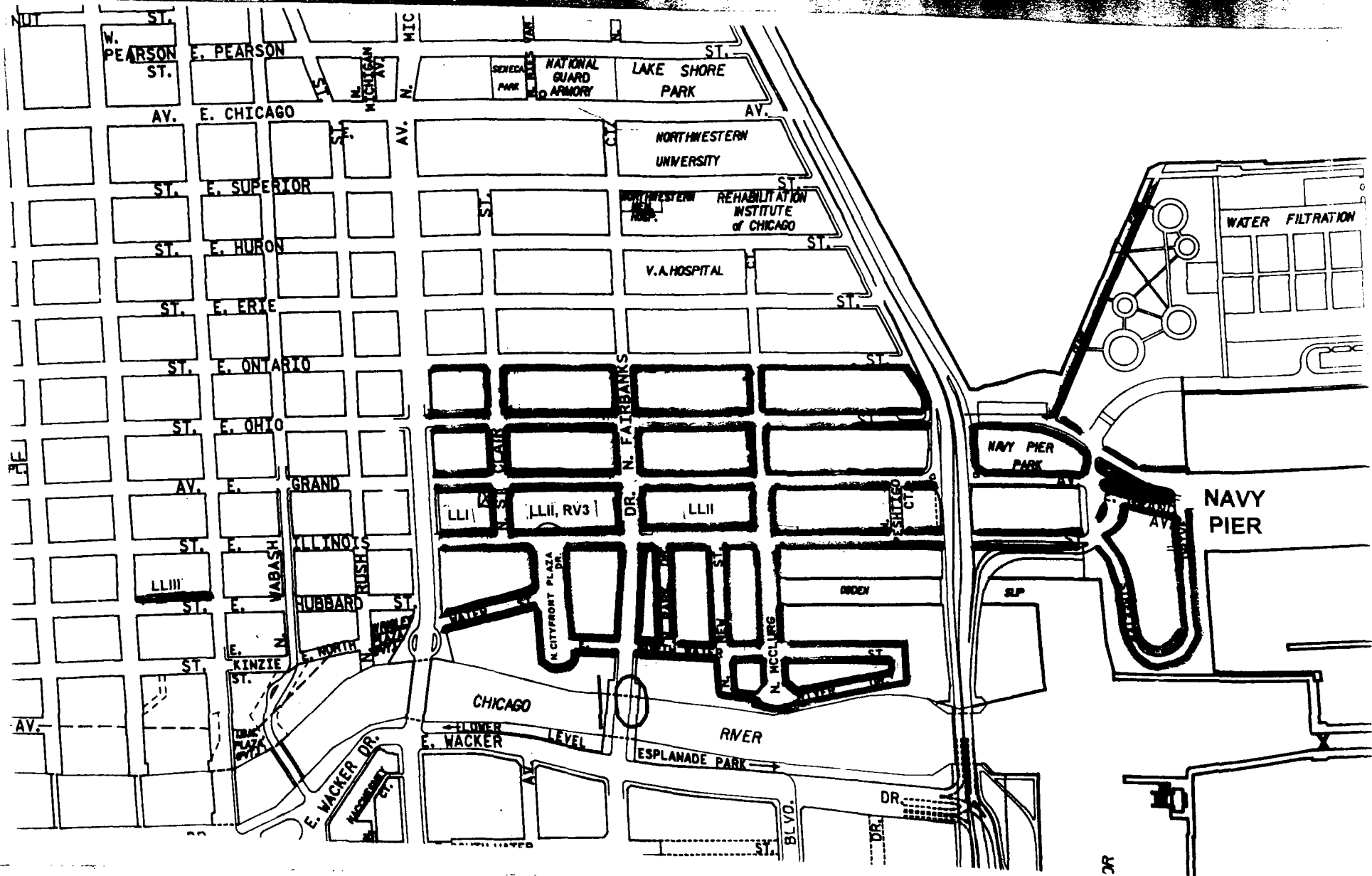
Most of the areas deviating from background appeared to be the facades of buildings made with brick, granite and other stone. The anomalous areas, which should not be designated contaminated until further followup investigations are conducted, include

- The northwest end of Navy Pier. A spike in the readings occurred just at the corner of the building. A survey with a portable sodium iodide spectrometer indicated thorium materials. There was not time to do a full survey of the area so it could not be determined if the spike was due to building materials, was due to materials in the building or under the sidewalk or under the street, nor could it be determined if the spike was due to natural radioactive materials or was due to actual contamination.
- St. Clair Street, between Illinois Street and Grand Avenue. This is to the east of the Lindsay Light Building (161 East Grand). A foot survey indicated stronger emissions from the street itself.
- The alley to the west of St. Clair Street, between Illinois Street and Grand Avenue. This is at the rear of the Lindsay Light Building. Foot surveys seem to indicate some elevated material was between or below the pavers composing the alley, where the blacktop was removed. Sodium iodide spectrometer readings indicated thorium materials. There was not time to do a full investigation so the pavers themselves may be the source of elevated readings. The readings have not been established to be due to contamination at this time.
- The empty parking lot at the east end of the block bounded by Grand Avenue, McClug Court and Ohio Street. This was known to be contaminated from a previous survey by

the land owner. No anomalous readings were seen from any of the adjacent streets by the scan van but a driveover of the property confirmed their presence, as did a foot survey. It was not unreasonable that street surveys by the scan van did not show contaminated areas since the foot survey showed gamma levels dropped to background within about 3 feet from a strong hot spot.

The North Columbus Drive Superfund Removal Action site was not seen by the scan van. Almost all of the contamination had been removed at the time of the scan. The radioactive material known to be along the periphery of the property was apparently strongly shielded by overlying soil and concrete.

The Null Hypothesis (that detectable contamination is not present) of our Data Quality Objectives was not confirmed. Anomalies were detected that may or may not indicate contamination. The limitations of varying distances to deposits of radioactive material, the scanning region (the detectors look horizontally and do not look directly below the van), and the diminishing strength of gamma emissions with distance were very profound during this scan.



QUALITY ASSURANCE PROJECT PLAN SCANNER VAN SURVEY

**Chicago Illinois
Streeterville Area**



United States Environmental Protection Agency
Radiation And Indoor Environments National Laboratory (R&IE)
4220 S. Maryland Parkway

Las Vegas, NV 89119

Quality Assurance Project Plan Approval Signatures

Project Manager or Representative, USEPA Region 5 Date

Laboratory Manager, R&IE Date

Director, CERMER (Center for Environmental
Restoration, Monitoring and Emergency Response) Date

Project Lead Date

Project Quality Assurance Coordinator

Date

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A. PROJECT MANAGEMENT

1 & 2. Title Page & Signature Page

Provided

3. Distribution List

USEPA, Region 5

Larry Jensen, CHP, Region 5
Verneta Simon, OSC, Region 5
Fredrick Micke, OSC, Region 5

USEPA/ORIA-R&IE

Jed Harrison, Director
Gregg Dempsey, CERMER Director
Roger Shura, Project Lead
Mark Sells, CERMER, QA Coordinator

4. Project/Task Organization

The key personnel responsible for the implementation of this QAPP are listed below:

Project Lead:

Name: Roger Shura
Title: Environmental Field Scientist, Project Lead

Field Scientist:

Name: Mark Sells
Title: Quality Assurance Coordinator

Project Lead

The Project Lead for this survey operation is responsible to assure that:

- Required documentation is prepared, is compatible with the field study procedures, is implemented, and complied with.

In addition to the above, the project lead will:

- Oversee the site survey process, data collection and storage.
- Review and validate data as required.
- Oversee any quality concerns that may occur during the project activities.
- Develop and implement a site specific procedure for the detector data Quality Assurance.
- Verify that all quality assurance requirements are met.

5. Problem Definition/Background

The Streeterville area of downtown Chicago Illinois is the focus of this scan. For the purposes of this document, Streeterville is described as the area bordered by North Michigan Avenue on the west and the Navy Pier and Streeter Drive on the east, with East Ontario Street on the north and Ogden Slip and North Water Street on the south. This area was, at one time, a center for processing of thorium ores for industrial and manufacturing applications. USEPA Region 5 has, in the Streeterville area, had one removal action fully completed and is now in the midst of a second, mostly completed, removal action. Residual contamination is known to be under some streets and one additional property is known to be contaminated but is not now subject to any response action. Further historical information concerning these sites is available through the regional office. USEPA Region 5 has requested that the R&IE Las Vegas facility assist in evaluating this area for potentially contaminated sites, using R&IE's scanner van to identify areas of elevated activity.

6. Project/Task Description and Schedule

This project will consist of a gamma radiation scanning survey, utilizing the USEPA/ORIA-R&IE Scanner Van. The Scanner Van has two 4" x 4" x 16" NaI detectors for surveying gamma radiation. One detector is shielded from background gamma radiation by being completely surrounded with copper and lead except on the right side 4" x 16" "window". The other NaI detector is unshielded for monitoring the ambient gamma radiation levels. Both detectors have their output signals sent to a count-rate (CPS) meter and also to a computer graphic display and data base

acquisition system utilizing custom software (Lab Windows) programmed recently by Bechtel-Nevada under contract (1998). The Scanner Van will be driven slowly (5-7 mph) while the detector signals are monitored on the CPS rate meter and computer graph display while being recorded to a computer data file for future evaluation. USEPA Region 5 will record anomalies as they are found by the scanner van. These will be investigated later by USEPA Region 5 staff once access agreements are obtained. Region 5 does not anticipate any immediate investigations of anomalies unless these can be done from public access areas.

Additional information will be maintained in the scan logbook as needed. This may include building type, construction materials, weather conditions, or any information that may be applicable

The Scanner Van survey will be performed to the best possible geometry and schedule as possible while taking into account the potential problems that are possible working in this type of area. Several of the streets are one-way venues in high traffic areas. Special escort may be required for optimum scans of these areas requiring movement against the normal flow of traffic. Detailed plans of direction and times will be established as needed by the van crew and USEPA Region 5 personnel supporting the survey. Escort will be provided by the City of Chicago.

WORK SCHEDULE

- | | |
|------------------|---|
| June 12, 2000 | Contractual transport of the Scanner Van to the work site for receipt by USEPA Region 5 personnel. |
| June 19, 2000 | Roger Shura and Mark Sells will travel to the work site via airline. |
| June 20, 2000 | Roger Shura and Mark Sells perform QA detector evaluations using appropriate check sources and background measurements. Scan of affected areas begin following the scanner van setup. |
| June 21-22, 2000 | Roger Shura and Mark Sells perform QA detector evaluations prior to scan van survey, perform radiological scanner van survey. |
| June 23, 2000 | Roger Shura and Mark Sells return to Las Vegas via airline. |

Interim	Gregg Dempsey, Roger Shura, and Mark Sells review data and prepare Scan Summary Memorandum for submission to USEPA Region 5.
July 7, 2000	Submission of final summary memorandum of scan anomalies to USEPA Region 5.

7. **Quality Objectives and Criteria for measurement Data**

The Streeterville section of Chicago has areas of contamination from thorium ore processing industries that operated in the area in the early 1900's. Some parts of Streeterville are sites of previous or current USEPA Region 5 Superfund removal activities. Locations adjacent to the removal sites have been confirmed as contaminated or are highly suspected to be contaminated. The purpose of this scan is to evaluate the remaining areas of Streeterville, where contamination has not been confirmed to exist.

For the purpose of this survey, these remaining areas (those not identified as contaminated) will be assumed to be free of contamination. If the survey areas are determined to have exposure rates or activity that is measurably greater than background, more detailed follow-up surveys will be performed by the regional office to verify that contamination is or is not present, and to better define the areas that are impacted.

The baseline condition statement is that the scan area is not impacted (i.e. that thorium contamination is not present). This is the null hypothesis. The alternative condition would be that the scan area may be impacted, or areas of contamination may exist. The null hypothesis assumes that the area is not impacted and that no further action is necessary and the alternative hypothesis would indicate that specific areas, or measurement units, need further characterization.

The decision errors for the Null hypothesis that detectable contamination is not present and the Alternative hypothesis that detectable contamination may be present are:

- Type I error: Measurements indicate that areas within Streeterville are contaminated when in truth, they are clean or uncontaminated.
- Type II error: Measurements indicate that the areas within Streeterville are uncontaminated when in truth, there is contamination present.

The decision performance goals for the survey are as follows:

- All surveys performed by the scanner van system on this project are qualitative and not quantitative, the purpose being simply to detect thorium contamination within the Streeterville area.
- Survey unit size is not defined for this survey. Specific areas where contamination is detected shall become defined measurement units, described by map position, GPS Coordinates, and length.
- Survey measurements are to be made as continuous scans along each street within the scan area and all measurements that are less than 2 times background values established for each specific terrain type or building that is measured shall be considered to validate the null hypothesis.
- Survey measurements that are greater than 2 times the background values established for each specific terrain type or building that is measured shall be defined as anomalous and be considered to validate the alternative hypothesis for that specific area or measurement unit.
- Previously established detection limit for the scanner van is 1 millicurie of ^{226}Ra at 100 feet = approximately 100 CPS above background. This is equivalent to approximately 2 times the detector background in open areas. The construction materials used in buildings in the Streeterville area are expected to have increased background which will effectively reduce the minimum detection limits of the system. In addition to distance, geometry (distribution of the source material in relation to the detector) and attenuation or scattering (items interfering with the direct measurement of gamma radiations) will reduce the detection limits of the system.

8. Special Training Requirements/Certification

The scanner van technology used on this project is unique and has been developed by the R&IE laboratory in Las Vegas. Familiarity with the scanner van systems and experience in operating these systems in different environments and conditions is vital to the success of the project. The scanner van instrumentation will be operated and controlled by experienced personnel for this project.

No special training requirements or certifications are identified specifically for this project beyond normal requirements to qualify for specific job titles. Individual records regarding training or education are maintained in personnel files by R&IE.

9. Documentation and Records

Data collection software in the scanner van system generates an electronic data file of the scan information in real time. This electronic data file includes system and GPS time tags and GPS location data for each data measurement recorded from the system shielded and unshielded detectors. The potential exists for interference to GPS data from tall buildings in the area. Where accurate GPS times and locations are suspect, system times and logbook annotations of locations will be used. A project logbook will be created and maintained by the van crew for reference purposes during the project operations and for the follow-up evaluation of data. The raw data records shall be archived and maintained by R&IE for reference as needed.

The results of the Streeterville scan will be given to USEPA Region 5 as they are obtained, so that USEPA Region 5 can begin immediate assessments. These will be treated as draft data from R&IE staff. A formal memorandum of summarized results will, for the record, follow at a later date. The summary will itemize all locations where anomalous increases in the exposure rate above the expected background are encountered. Copies of the memorandum and any other correspondence concerning the Streeterville scan shall be filed with the original raw data files for the project.

B. MEASUREMENT/DATA ACQUISITION

1. Sampling Process Design

The Scanner Van will be driven slowly (5-7 mph) along each side of the streets identified in the Streeterville scan area. The schedule for the scan should allow for comprehensive scanning of all of the streets in the scan area

Safety shall always be the first consideration while moving the van into desired positions for optimum scanning. The Streeterville area includes one-way streets as well as potential high traffic areas. Escorts may be required to scan some areas that require slow movements or movement against the normal direction of traffic. Escort will be provided by City of Chicago staff.

At least one USEPA Region 5 staff person will accompany scanner van staff at all times. This person can provide information, provide consultation and serve as a liaison with outside parties (citizens, media, etc.) if necessary.

Prior to scanning the Chicago Streeterville area, suitable background measurements will be taken in areas similar in construction and building materials, where possible,

to determine the local ambient gamma radiation levels. The Scanner Van's detector outputs levels are highly dependent on the varying physical geometry that the detector is "seeing" while scanning. Building construction materials, especially granites or red brick, and some other stone construction materials, are significant potential interferences to detection of radioactivity at or near background levels. Geometry dependent background measurements will provide a local baseline for the actual scanning survey.

This qualitative data is subjective by being dependent on the geometry and materials being viewed, however, anomalous gamma levels (compared to gamma background) can be determined by an experienced operator. The system operator will monitor the detector output count-rate meter and computer graphic display while viewing the type of construction or terrain through the van side window. The van will be stopped when apparent anomalies (elevated readings more than 50% higher than background) are encountered. The van will then be maneuvered back until the highest reading is again displayed. When a count rate is observed to be more than twice expected background value, potential contamination will be suspected. The anomalous values will be mapped and included in the survey report as areas requiring further investigation. Additional survey instrumentation will be carried by the van crew for use to identify specific nuclides and exposure rates, but specific area surveys will only be performed on public property, if needed. USEPA will investigate anomalies thought to be coming from private properties once legal access agreements are obtained.

2. Sampling Methods Requirements

N/A - There will be no physical samples collected during this scan operation

3. Sample Handling and Custody Requirements

N/A - There will be no physical samples collected during this scan operation.

4. Analytical Methods Requirements

N/A - There will be no physical samples collected during this scan operation

5. Quality Control Requirements

Detector quality control checks shall be performed daily using check source materials provided by R&IE. Detector response will be compared to previous calibrations and similar source checks. QA checks will be recorded in the project scan logbook. Deviations from expected detector response will be reported to all persons associated with the scan project and corrective actions will be made if possible.

Additional quality control checks and detector response tests will be made as possible using sites that are identified as contaminated or previously contaminated with radioactive thorium. These sites will be identified by the USEPA Region 5 personnel at the beginning of the survey background collection operations, if they are available for scanning purposes.

A specific location will be identified for background repeatability checks. The same location will be used daily to verify that the system detectors are operating properly at the background level.

All quality control measurements shall be identified in the project logbook. Reference to the date, time, location, source identification, and associated system data file will be logged with each measurement.

6. Instrument/Equipment Testing, Inspection, and Maintenance Requirements

The data collection system and detector operation will be checked at the beginning and end of each scan period. The operational status of the equipment will be assessed using the background and source measurements described above. Significant deviation from expected values will indicate a failure of the system. In the event of a system failure, attempts will be made to replace or repair problem components if possible. If the system is not repairable in a reasonable time, scan operations will be terminated and re-scheduled to meet the requirements of USEPA Region 5.

No special maintenance operations will be required during the Streeterville scan project, beyond routine vehicle maintenance and fueling.

7. Instrument Calibration Frequency

The scanner van detectors are not calibrated to a specific response or geometry. Source measurement checks are made routinely prior to scan operations prior to

departure of the van from Las Vegas. The response of the detector system in the van is partially dependant on the background activity in the scan area as well as the distribution of radionuclides in the scan window.

The detector response for the scanner van was checked in Las Vegas, immediately prior to the scan of the Streeterville area. The detector was exposed to 1 millicurie of radium-226 at set distances from the center of the detector. Based on the data collected during exposure to the source, it was determined that the detector can differentiate a point source of this activity from natural background at distances greater than 100 feet.

8. Inspection/Acceptance Requirements for Supplies and Consumables

N/A - No supplies or consumables are required for this project.

9. Data Acquisition Requirements (Non-direct Measurements)

N/A - There are no non-direct measurements used for consideration of planning objectives for this scan project.

10. Data Management

Data generated by the scanner van instrument and computer system is stored as text data files by in real time during scan operations. Access to the data files collected during scan operations is limited to scanner van operators. The data files that are generated during the Streeterville scan operations will be backed up (duplicated) daily during the project.

A project logbook will be maintained by the scan crew in addition to electronic data collection. The logbook will be used to record additional information related to the scan as it is completed.

All acquired data, including notes taken during field operations will be compiled at the end of the field portion of the project. All data will be reviewed by the responsible analyst for inconsistencies and errors. All data will be archived as reference material until the conclusion of the project or as required by USEPA Region 5.

C. ASSESSMENT/OVERSIGHT

1. Assessments and Response Actions

The scanner team will examine the data, documentation, and reports for completeness, comparability, representativeness, precision and accuracy to determine if any changes were made to the plan during the course of the work.

Assessment of the environmental data will be used to evaluate whether the data meet the objectives of the survey, and whether the data is sufficient to meet its intended use.

If unexpected or adverse conditions or hazards are encountered on the site during assessment, all members of the assessment team shall be notified. The Project lead or the representatives from USEPA Region 5 shall have the authority to issue a stop work order until the problem or issue has been resolved.

2. Reports to Management

Data quality assessment and quality assurance problems will be identified and presented to the project lead and the regional representatives as soon as possible. These initial reports will allow potential measurement problems to be identified and the need for corrective action can be assessed.

Problems that are identified with survey measurements, source characterizations, or other activities which may affect the work schedule will be provided to the project lead and regional representatives as soon as possible so that required scheduling adjustments can be effected.


D. DATA VALIDATION AND USABILITY

1. Data Review, Validation, and Verification Requirements

The acceptability requirements will include an examination of the field and quality control data. This examination will include:

- evaluation of data completeness

- verification of instrument calibration



OK

- measurement of detector response to check sources (measurement reproducibility)
- assessment or adherence to QC limits

2. Validation and Verification Methods

Data review is conducted in order to assess the effectiveness of measurements. Data will be examined for the following: bias, accuracy, representativeness, comparability and completeness. The following methods will be applied for each area:

Field:	Detector response checks using check sources will be within 10% of each other.
Bias:	The method to be used to ensure that analytical bias is not a significant problem will be to use repeatability of detector response checks to demonstrate the lack of analytical bias.
Precision/ Accuracy:	Scan measurements are only to be qualitative and not quantitative. The data collected during the scan operations is not intended to be used to determine or estimate radionuclide activity or type.
Representativeness:	Scan measurements will be carried out in such a way to ensure that enough data points are obtained to conduct impacted and/or not-impacted decision making.
Comparability:	Scan survey data will be compared as required to assure that measurements are of good quality and to identify any areas where additional measurements may be required to support decision making efforts.
Completeness:	The completeness of the Streeterville scan will be evaluated by comparing actual scanned streets against the expected total scan area. The scan process could potentially be impeded by obstructions or rights of way problems which would exclude some areas from optimum scan.

3. Reconciliation with User Requirements

The USEPA Region 5 representative, Larry Jensen, has agreed to the process, schedule, and data uncertainties outlined in this document.

Scan data will be used specifically to identify areas of elevated exposure rates in relation to background measurements in the Streeterville area of downtown Chicago. Data limitations have been discussed with the USEPA Region 5 representative. Summaries of scan data will be presented to the regional representative, and decisions to further characterize or not characterize specific areas will be made by the region.